EVR COST ANALYSIS SPREADSHEET AS OF AUGUST 30, 2002

CHANGES TO COST ANALYSIS SINCE MARCH 29TH TECH REVIEW REPORT

1 Corrected Equipment Costs by replacing 0.25 with 0.88 on Summary worksheet to correct error in original cost analysis. This change increased equipment costs by a factor of 3.5 as compared to the Feb. 2000 EVR staff report.

	Present Value Annualized Costs (AC)	
Year 1	(AC)	= (AC)
Year 2	(AC)(1/[1+ i])	= (AC)(0.91)
Year 3	(AC)(1/[1+ i]^2)	= (AC)(0.83)
Year 4	(AC)(1/[1+ i]^3)	= (AC)(0.75)

Assume 25% of stations upgrade to EVR in each year

Total Annual Equipment cost = (0.25)(AC) + (0.25)(AC)(0.91) + (0.25)(AC)(0.83) + (0.25)(AC)(0.75)
= (0.25)(AC) + (0.23)(AC) + (0.21)(AC) + (0.19)(AC)
= (0.88)(AC)

2 Reduced R&D and certification costs by halving the number of expected certified systems:

Phase I	was 14	now 7
Phase II	was 64	now 32
ISD	was 16	now 8

3 Increased ISD "worst-case" equipment costs based on 6/13/02 Veeder-Root e-mail

	tech rev	now
TLS-350ISD	$4,500	$3,995
Dispenser Interface		$670
Pressure sensor	$750	$595
Flow sensor	$900	$885
Inventory sensor	not incl	$1,095

	GDF1	GDF2	GDF3	GDF4	GDF5
EVR Tech Review	$6,150	$6,600	$7,950	$9,300	$10,650
Now	$8,883	$9,625	$10,656	$11,980	$13,308

4 Reduced ISD installation costs based on 4/15/02 Veeder-Root comment letter

EVR ISOR was $1230 per dispenser
EVR Tech Review doubled cost to $$2560 per dispenser

Veeder-Root costs based on experience in installing ISD at nine sites ($55/hr):
Two line items: Base install per facility and per-dispenser install

	Base	Per Dispenser	Example: GDF 3
New	$250	$125	$250 + 3 x $125 = $625

Retrofit	$300	$200	$300 + 3 x $200 = $900

The higher retrofit costs were used for the cost analysis.

5 Revised ISD maintenance/calibration/repair costs

EVR ISOR did not include these costs
EVR Tech Review assumed $1200/yr as suggested by Glenn Co. APCD

Veeder-Root suggests costs depend on number of ISD components

	Unit Cost		GDF1	GDF2	GDF3	GDF4	GDF5
A/L sensor	$300						
Pressure sensor	$200						
Datalogger	$50	TOTAL	$550	$700	$1,150	$1,600	$2,050

6 Revised ISD emission reductions from 6.6 to 8.5 tons/day as calculated in tech review report.

7 Revise ORVR emission reductions from 6.3 to 4.5 tons/day as calculated in tech review report.

8 Adjust ISD costs to 1999 Dollars

The original EVR cost analysis was in terms of 1999 dollars. The ISD costs are in terms of 2001 dollars. The ISD costs have been adjusted to 1999 values by 0.94.
This is the ratio of the 1999 Consumer Price Index (CPI) to the 2001 CPI (166.6/177.1 = 0.941).

9 Update to 1999 Gasoline Throughput

The original EVR cost analysis used the 1997 total CA Gasoline throughput of 13.5 billion gallons.
The throughput has been updated to the 1999 total CA gasoline throughput of 14.5 billion gallons

10 Added costs for annual balance station field testing

Currently, balance systems are required in most districts to be tested every five years. EVR will require annual testing of balance systems as part of ISD maintenance & calibration. Costs are estimated at $800 annually, as estimated by the SCAQMD vapor recovery rule staff report.

11 Clarified number of dispensers vs. number of fueling points for input variable table on summary page.

For example, the original table denoted 2 dispensers for GDF1, but this is intended to be 1 dispenser with two fueling points as denoted in Table 2-12 of ISOR reference 26, USEPA Phase II Technical Guidance

COST-EFFECTIVENESS SUMMARY

Input Values Used in Cost Analysis

Input variable used in Cost Analysis	Input value for each Model GDF 1	2	3	4	5
Nominal Monthly Average Sales per GDF, gals/month-GDF	13,233	37,500	75,000	150,000	300,000
Population Distribution (EPA, 1991 adjusted to fit current pc	4.7%	14.1%	45.7%	31.3%	4.2%
Estimated Number of GDFs (11,250 total)	531	1,586	5,136	3,522	475
Total Annual Sales, million gals/yr	84	769	4,981	6,830	1,843
Number of Processors per GDF (when applicable)	1	1	1	1	1
Number of Drop Tubes & Spill Buckets per GDF	2.5	2.5	2.5	2.5	2.5
Wtd-Avg Number of Nozzles per GDF (EPA, 1991)	2.5	3.25	6.5	9.75	16.25
Number of Fueling Points per GDF (EPA, 1991)	2	3	6	9	12

Est. population-wtd average gallons per month using popula	99,779	Total 1999 CA gasoline sales =	14,514,435,002	gals
Actual population-wtd average gallons per month	99,865	Total GDFs in CA in 1998 =	11,250	

Emission Reductions per Model GDF

Module	Description	2010 ROG Reductions Statewide, tons/day	Emission Reductions by Model GDF and Module, tons/day 1	2	3	4	5
1	Phase I	5.5	0.03	0.29	1.89	2.59	0.70
2	Phase II	3.1	0.02	0.16	1.06	1.46	0.39
3	ORVR Compatibility	4.5	0.03	0.24	1.54	2.12	0.57
4	Liquid Retention	0.2	0.00	0.01	0.07	0.09	0.03
5	Spillage/Dripless Nozzle	3.9	0.02	0.21	1.34	1.84	0.50
6	In-Station Diagnostics	8.5	0.05	0.45	2.92	4.00	1.08
	Total	25.7	0.15	1.36	8.82	12.10	3.27

Cost-Effectiveness (C.E.) & Impacts to GDFs and Consumers

Module	Description	Cost-Effectiveness by Model GDF and Module 1999 Dollars per Pound ROG Reduced 1	2	3	4	5	Overall Cost-Effectiveness by Module only
1	Phase I C.E. (Annual Costs/Annual Reductions)	$12.54	$3.94	$1.84	$0.81	$0.28	$1.33
	Annualized Equip Costs (assumes 25%/yr conve	$270,908.86	$809,282.83	$2,620,239.69	$1,796,722.67	$242,440.47	
	Annualized R&D Costs (assume 5% of Total R&	$16,580.38	$49,530.38	$160,366.04	$109,964.48	$13,998.15	
	Annualized Cert & Testing (assume 5% of Total	$11,015.31	$32,905.92	$106,540.49	$73,055.80	$9,299.79	
	Annual Gasoline Recovery Credit	($5,889.43)	($53,721.55)	($347,871.82)	($450,073.46)	($121,461.18)	
2	Phase II C.E. (Annual Costs/Annual Reductions)	$105.93	$36.80	$23.21	$13.95	$8.09	$18.13
	Annualized Equip Costs (assumes 25%/yr conve	$1,120,673.38	$3,621,113.67	$15,559,187.07	$13,298,771.89	$2,151,227.21	
	Annualized R&D Costs (assume 50% of Total R	$165,803.84	$495,303.84	$1,603,660.35	$1,099,644.78	$148,380.38	
	Annualized Cert & Testing (assume 50% of Tota	$110,153.14	$329,059.17	$1,065,404.92	$730,558.04	$98,577.73	
	Annual Gasoline Recovery Credit	($3,319.50)	($30,279.42)	($196,073.21)	($268,898.44)	($72,567.53)	
3	ORVR Compatibility (Annual Costs/Annual Reduct	$6.92	$2.66	$2.20	$1.46	$0.96	$1.74
	Annualized Equip Costs (assumes 25%/yr conve	$81,712.63	$342,102.01	$2,215,268.25	$2,278,544.99	$456,764.76	
	Annualized R&D Costs (assume 10% of Total R	$33,160.77	$99,060.77	$320,732.07	$219,928.96	$29,676.08	
	Annualized Cert & Testing (assume 10% of Tota	$22,030.63	$65,811.83	$213,080.98	$146,111.61	$19,715.55	
	Annual Gasoline Recovery Credit	($4,818.63)	($43,954.00)	($268,511.70)	($390,336.44)	($105,339.96)	
4	Liquid Retention (Annual Costs/Annual Reductions	$62.19	$23.14	$17.81	$11.96	$9.04	$14.49
	Annualized Equip Costs (assumes 25%/yr conve	$25,391.78	$98,608.32	$638,534.33	$656,773.37	$147,702.67	
	Annualized R&D Costs (assume 5% of Total R&	$16,580.38	$49,530.38	$160,366.04	$109,964.48	$14,838.04	
	Annualized Cert & Testing (assume 5% of Total	$11,015.31	$32,905.92	$106,540.49	$73,055.80	$9,857.77	
	Annual Gasoline Recovery Credit	($214.16)	($1,953.51)	($12,649.88)	($17,348.29)	($4,681.78)	
5	Spillage/Dripless Nozzle (Annual Costs/Annual Re	$2.95	$0.95	$0.67	$0.37	$0.22	$0.50
	Annualized Equip Costs (assumes 25%/yr conve	$25,391.78	$98,608.32	$638,534.33	$656,773.37	$147,702.67	
	Annualized R&D Costs (assume 5% of Total R&	$16,580.38	$49,530.38	$160,366.04	$109,964.48	$14,838.04	
	Annualized Cert & Testing (assume 5% of Total	$11,015.31	$32,905.92	$106,540.49	$73,055.80	$9,857.77	
	Annual Gasoline Recovery Credit	($4,176.14)	($38,093.46)	($246,672.75)	($338,291.58)	($91,294.64)	
6	In-Station Diagnostics (Annual Costs/Annual Redu	$34.15	$12.17	$7.39	$4.29	$2.38	$5.71
	Annualized Equip Costs (assumes 25%/yr conve	$1,109,949.41	$3,694,016.46	$14,999,331.94	$12,366,277.05	$1,949,645.78	
	Annualized R&D Costs (assume 25% of Total R	$78,209.36	$233,633.89	$756,443.56	$518,700.37	$69,990.75	
	Annualized Cert & Testing (assume 25% of Tota	$51,959.03	$155,216.59	$502,549.49	$344,602.85	$46,498.93	
	Annual Gasoline Recovery Credit	($8,586.65)	($78,324.73)	($507,188.76)	($695,568.08)	($187,712.73)	
	Total Annual Costs by Model GDF Category	$3,151,127.19	$10,042,799.94	$40,354,718.45	$32,501,954.51	$4,997,954.73	**$91,048,555**
	Total Annual Costs per each GDF in a Model GDF	**$5,934.33**	**$6,331.16**	**$7,857.46**	**$9,229.05**	**$10,517.58**	*overall annual cost*
	Per-gallon cost increase for consumers, cents/gall	**3.74**	**1.31**	**0.81**	**0.48**	**0.27**	**0.63**
	Non-Wtd Cost-Effectiveness for All Modules by Mo	**$28.90**	**$10.10**	**$6.27**	**$3.68**	**$2.10**	*vg. per-gal increas*
	Cost-Effectiveness without ISD	**$17.60**					

(cents per gallon)

Notes:
Gasoline price/gal assu $1.50
Per-gallon increase for consumers assumes all costs passed on to consumers
Gasoline density, lb/gal 6.3

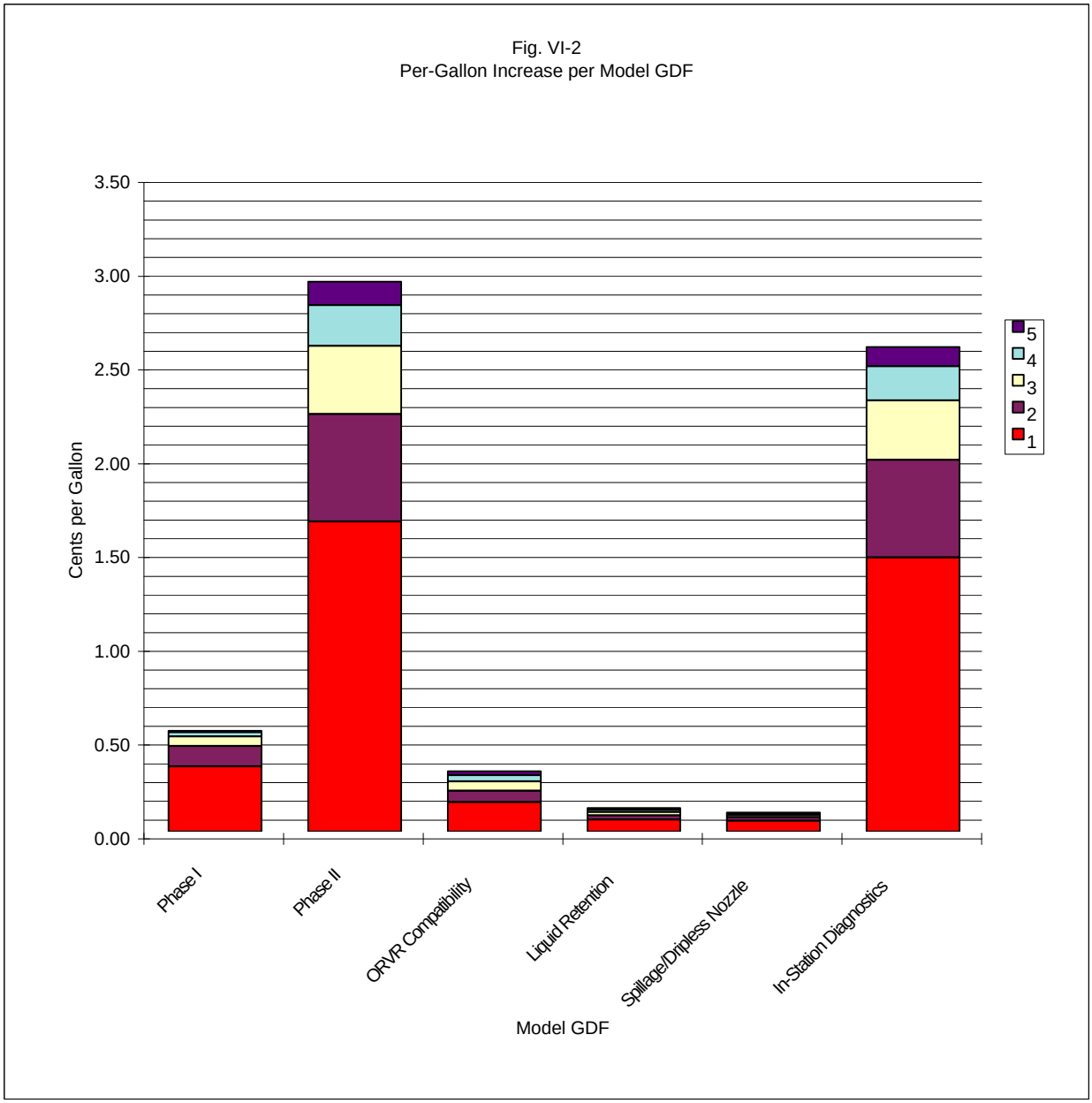
OVERALL COST EFFECTIVENESS: Total costs/ Total Emission Benefits
= (costs [$/yr])/(emissions[tons/day){1ton/2000lb}{1yr/365days}

= **$4.85 dollars/lb**

Per-Gallon Cost Increase by Module and Model GDF

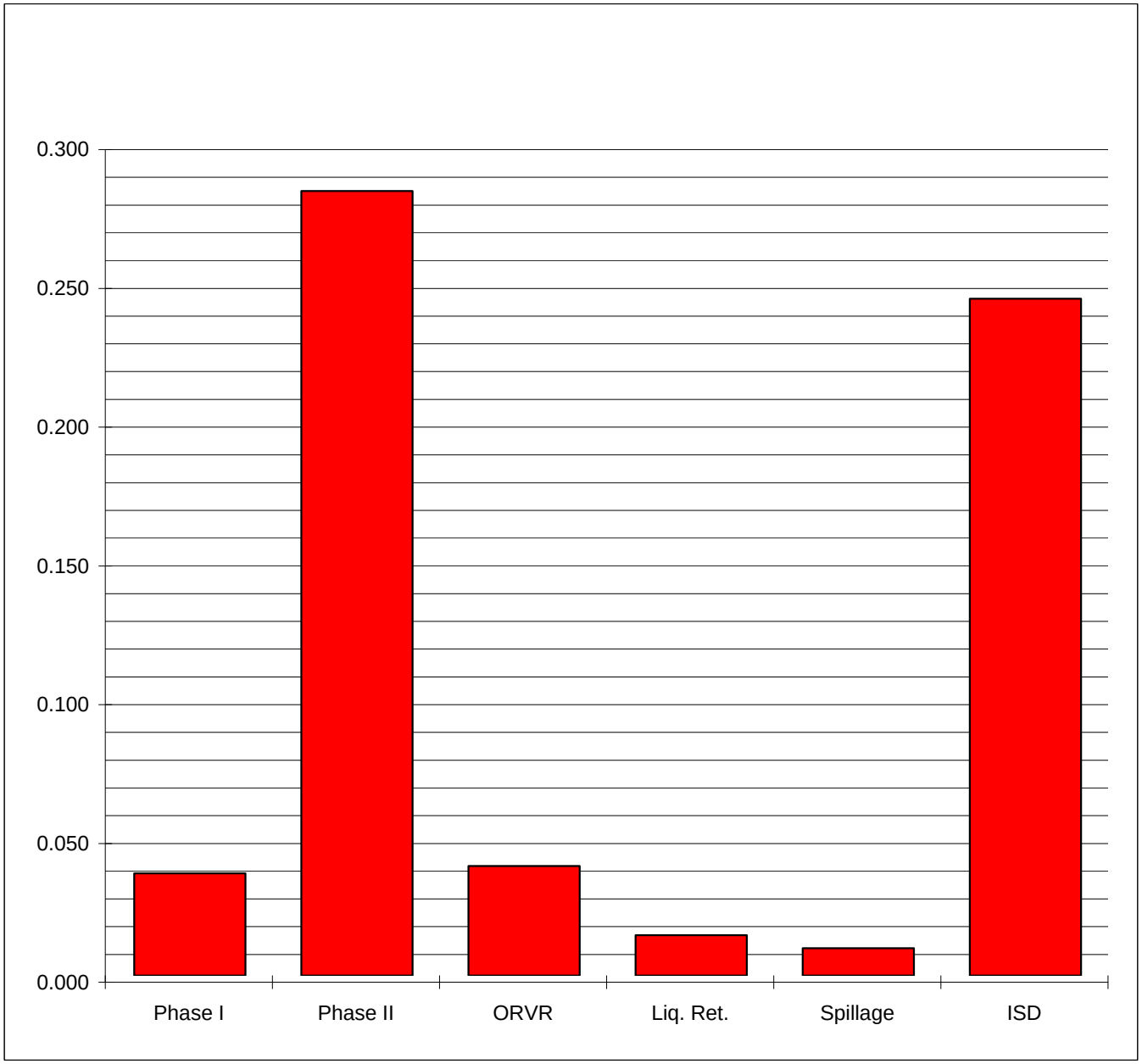
		Per-Gallon Cost Increase by Module and Model GDF, cents per gallon				
	Model GDF	1	2	3	4	5
Module	Per-GDF Throughput, g	13,233	37,500	75,000	150,000	300,000
1	Phase I	0.35	0.11	0.05	0.02	0.01
2	Phase II	1.65	0.57	0.36	0.22	0.13
3	ORVR Compatibility	0.16	0.06	0.05	0.03	0.02
4	Liquid Retention	0.06	0.02	0.02	0.01	0.01
5	Spillage/Dripless Nozzl	0.06	0.02	0.01	0.01	0.00
6	In-Station Diagnostics	1.46	0.52	0.32	0.18	0.10
Total Cents per Gal Increase by		3.74	1.31	0.81	0.48	0.27

Fig. VI-2
Per-Gallon Increase per Model GDF



Per-Gallon Cost Increase by Module

Module	Description	Annual Costs, $Million/yr	Cents per Gallon
1	Phase I	$5.3	0.037
2	Phase II	$41.0	0.283
3	ORVR	$5.7	0.039
4	Liq. Ret.	$2.1	0.015
5	Spillage	$1.4	0.010
6	ISD	$35.4	0.244
	Total	$91.0	0.627



Estimated Equipment Costs for a Model GDF 1 Facility per Proposed Module

Proposed Module	Unit Cost 1999 Dollars	Number of Components in Model GDF Bal-1	Bal-2	Hybrid	Assist-1	Assist-2
Module 1 (Phase I)						
Phase I Components						
Pressure/Vacuum (P/V) valve	$65	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cov	$351	2.5	2.5	2.5	2.5	2.5
Drop tube & overfill protection	$178	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	$55	2.5	2.5	2.5	2.5	2.5
Installation Costs						
Pressure/Vacuum (P/V) Valve	$80	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cov	$160	2.5	2.5	2.5	2.5	2.5
Drop tube & overfill protection	$160	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	$80	2.5	2.5	2.5	2.5	2.5
Module 1 -- Total Fixed Cost (All Equipment)		$2,823	$2,823	$2,823	$2,823	$2,823
Module 1 -- Total Annualized Cost = Total Fixed Cost x CRF		$580	$580	$580	$580	$580
		Avg Fixed	$2,823	Avg Annual		$580
Module 2 (Phase II w/pressure-related fugitives)						
Dispenser Components						
Nozzle -- Balance	$200	2.5	2.5			
Nozzle -- Hybrid	$231			2.5		
Nozzle -- Assist Type 1	$209				2.5	
Nozzle -- Assist Type 2	$225					2.5
Modified Equipment (Dispenser-related)	$382	2.5	2.5			
Modified Equipment (Dispenser-related)	$468			2.5		
Modified Equipment (Dispenser-related)	$400				2.5	

Modified Equipment (Dispenser-related)	$220						2.5
Auxilliary Items (incl. P/V, collection & processor)							
Assist Type 1	$7,500					1.0	
Assist Type 2	$9,000						1.0
Vapor processor							
for those Balance systems that use pro	$7,500		1.0	1.0	1.0		
Installation Costs		old					
Nozzle -- Balance	$172	$86	2.5	2.5			
Nozzle -- Hybrid	$215	$108			2.5		
Nozzle -- Assist Type 1	$97	$48				2.5	
Nozzle -- Assist Type 2	$108	$54					2.5
Modified Equipment (Dispenser-related)	$344	$172	2.5	2.5			
Modified Equipment (Dispenser-related)	$430	$215			2.5		
Modified Equipment (Dispenser-related)	$194	$97				2.5	
Modified Equipment (Dispenser-related)	$215	$108					2.5
Auxilliary Items -- Assist Type 1	$3,012	$1,506				1.0	
Auxilliary Items -- Assist Type 2	$2,581	$1,291					1.0
Vapor processor -- Balance	$3,012	$1,506	1.0	1.0	1.0		

Module 2 -- Total Fixed Cost (All Equipment)	$13,257	$13,257	$13,873	$12,760	$13,501
Module 2 -- Total Fixed Cost (TFC Nozzles)	$715	$715	$847	$643	$696
Module 2 -- Total Fixed Cost (TFC Dispensers)	$1,385	$1,385	$1,707	$1,242	$820
Module 2 -- Total Fixed Cost (TFC All Other Equipment)	$11,157	$11,157	$11,319	$10,875	$11,985
Module 2 -- Annualized Cost = Fixed Costs (TFC Nozzles) x	$288	$288	$341	$259	$280
Module 2 -- Annualized Cost = Fixed Costs (TFC Dispensers	$284	$284	$351	$255	$168
Module 2 -- Annualized Cost = Fixed Cost (TFC All Others) x	$1,816	$1,816	$1,842	$1,770	$1,950
Module 2 -- Total Annualized Costs (All Equipment)	$2,388	$2,388	$2,533	$2,284	$2,399
	Avg Fixed	$13,330	Avg Annual		$2,398

Module 3 (ORVR Compatibility)

Components						
Nozzle (Healy ORVR compatible drop-i	$54				2.5	2.5
Assumed 25% premium over Module 2-compliant nozzle (applies to assist only)						
Dispenser sensor & related electronics (Hoffer Flow Control)	$200	2.0	2.0	2.0		
Installation Costs						
Nozzle (Healy ORVR compatible drop-i	$160				2.5	2.5
Dispenser sensor & related electronics	$160	2.0	2.0	2.0		
Module 3 -- Total Fixed Costs (Equipment Purchase + Instal		$720	$720	$720	$536	$536
Module 3 -- Total Fixed Costs (Nozzles)		$0	$0	$0	$536	$536
Module 3 -- Total Fixed Costs (Dispensers)		$720	$720	$720	$0	$0
Module 3 -- Annualized Costs = Fixed Costs (Nozzles) x CRI		$0	$0	$0	$215	$215
Module 3 -- Annualized Costs = Fixed Costs (Dispensers) x		$148	$148	$148	$0	$0
Module 3 -- Total Annualized Costs (All Equipment)		$148	$148	$148	$215	$215
		Avg Fixed	$646	Avg Annual		$175

Module 4 (Liquid Retention -- Redesigned Nozzle)

Assumed 25% premium over Module 2-nozzle; in-nozzle design only; no extra installation	$54	2.5	2.5	2.5	2.5	2.5
Module 4 -- Total Fixed Costs (Equipment Purchase + Instal		$135	$135	$135	$135	$135
Module 4 -- Annualized Costs = Fixed Costs x CRF3		$54	$54	$54	$54	$54
		Avg Fixed	$135	Avg Annual		$54

Module 5 (Spillage, including Dripless Nozzle)

Assumed 25% premium over Module 2-nozzle; in-nozzle design only; no extra installation	$54		2.5	2.5	2.5	2.5	2.5
Module 5 -- Total Fixed Costs (All Equipment)			$135	$135	$135	$135	$135
Module 5 -- Annualized Costs = Fixed Costs x CRF3			$54	$54	$54	$54	$54
			Avg Fixed	$135	Avg Annual		$54

Module 6 (In-Station Diagnostics)

Components (Veeder-Root Cost Estimates)		(OLD)					
Sensors -- Pressure	$595	$192	1.0	1.0	1.0	1.0	1.0
Sensors -- A/L	$885	$245	1.0	1.0	1.0	1.0	1.0
Datalogger w/EPROM & new CPU/moth	$3,995	$1,197	1.0	1.0	1.0	1.0	1.0
Dispenser interface	$670		1.0	1.0	1.0	1.0	1.0
Inventory sensor (ATG)	$1,095		2.5	2.5	2.5	2.5	2.5
Installation Costs: assume retrofit costs of $300 base + $200 per dispenser							
	$500	$1,280	1.0	1.0	1.0	1.0	1.0
Module 6 -- Total Fixed Costs (All Equipment)			$9,383	$9,383	$9,383	$9,383	$9,383
Module 6 -- Annualized Costs = Total Fixed Costs x CRF1			$1,527	$1,527	$1,527	$1,527	$1,527
Module 6 - Annualized maintenance/calib/repair			$520	$520	$520	$520	$520
Additional cost for annual balance system tests			$800	$800	$800	$0	$0
			Avg Fixed	$9,383	Avg Annual		$2,527

Total Fixed Costs (All Modules)	$26,452	$26,452	$27,068	$25,771	$26,512
Total Annualized Fixed Costs (All Modules)	$6,071	$6,071	$6,217	$5,234	$5,350

Notes

Cost Recovery Factor CRF1 (10% discou	0.1627	Average Total Fixed Cost	$26,451

Cost Recovery Factor CRF2 (10% discou	0.2054
Cost Recovery Factor CRF3 (10% discou	0.4021

* from Healy Systems, 1999.

Average Total Annualized Cost	$5,789

Estimated Equipment Costs for a Model GDF 2 Facility per Proposed Module

Proposed Module	Unit Cost 1999 Dollars	Number of Components in Model GDF Bal-1	Bal-2	Hybrid	Assist-1	Assist-2
Module 1 (Phase I)						
Phase I Components						
Pressure/Vacuum (P/V) valve	$65	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cover	$351	2.5	2.5	2.5	2.5	2.5
Drop tube & overfill protection	$178	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	$55	2.5	2.5	2.5	2.5	2.5
Installation Costs						
Pressure/Vacuum (P/V) Valve	$80	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cover	$160	2.5	2.5	2.5	2.5	2.5
Drop tube & overfill protection	$160	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	$80	2.5	2.5	2.5	2.5	2.5
Module 1 -- Total Fixed Cost (All Equipment)		$2,823	$2,823	$2,823	$2,823	$2,823
Module 1 -- Total Annualized Cost = Total Fixed Cost x CRF2		$580	$580	$580	$580	$580
		Avg Fixed	$2,823	Avg Annual		$580
Module 2 (Phase II w/pressure-related fugitives)						
Dispenser Components						
Nozzle -- Balance	$200	3.25	3.25			
Nozzle -- Hybrid	$231			3.25		
Nozzle -- Assist Type 1	$209				3.25	
Nozzle -- Assist Type 2	$225					3.25
Modified Equipment (Dispenser-related) -- Balance	$382	3.25	3.25			
Modified Equipment (Dispenser-related) -- Hybrid	$468			3.25		
Modified Equipment (Dispenser-related) -- Assist Ty	$400				3.25	
Modified Equipment (Dispenser-related) -- Assist Ty	$220					3.25
Auxilliary Items (incl. P/V, collection & processor)						
Assist Type 1	$7,500				1.00	
Assist Type 2	$9,000					1.00

Vapor processor							
for those Balance systems that use processors	$7,500		1.00	1.00	1.00		
Installation Costs		OLD					
Nozzle -- Balance	$172	$86	3.25	3.25			
Nozzle -- Hybrid	$215	$108			3.25		
Nozzle -- Assist Type 1	$97	$48				3.25	
Nozzle -- Assist Type 2	$108	$54					3.25
Modified Equipment (Dispenser-related) -- Balance	$344	$172	3.25	3.25			
Modified Equipment (Dispenser-related) -- Hybrid	$430	$215			3.25		
Modified Equipment (Dispenser-related) -- Assist Ty	$194	$97				3.25	
Modified Equipment (Dispenser-related) -- Assist Ty	$215	$108					3.25
Auxilliary Items -- Assist Type 1	$3,012	$1,506				1.00	
Auxilliary Items -- Assist Type 2	$2,581	$1,291					1.00
Vapor processor -- Balance	$3,012	$1,506	1.00	1.00	1.00		
Module 2 -- Total Fixed Cost (All Equipment)			$14,081	$14,081	$14,882	$13,434	$14,077
Module 2 -- Total Fixed Cost (TFC Nozzles)			$930	$930	$1,101	$836	$905
Module 2 -- Total Fixed Cost (TFC Dispensers)			$1,800	$1,800	$2,220	$1,615	$1,066
Module 2 -- Total Fixed Cost (TFC All Other Equipment)			$11,351	$11,351	$11,561	$10,983	$12,106
Module 2 -- Annualized Cost = Fixed Costs (TFC Nozzles) x CRF3			$374	$374	$443	$336	$364
Module 2 -- Annualized Cost = Fixed Costs (TFC Dispensers) x CRF2			$370	$370	$456	$332	$219
Module 2 -- Annualized Cost = Fixed Cost (TFC All Others) x CRF1			$1,847	$1,847	$1,881	$1,788	$1,970
Module 2 -- Total Annualized Costs (All Equipment)			$2,591	$2,591	$2,780	$2,455	$2,553
			Avg Fixed	$14,111	Avg Annual		$2,594

Module 3 (ORVR Compatibility)

Components						
Nozzle (Healy ORVR compatible drop-in assist nozz	$54				3.25	3.25
Assumed 25% premium over Module 2-compliant nozzle (applies to assist only)						
Dispenser sensor & related electronics (Hoffer Flow Control)	$200	3.00	3.00	3.00		
Installation Costs						
Nozzle (Healy ORVR compatible drop-in assist nozz	$160				3.25	3.25
Dispenser sensor & related electronics	$160	3.00	3.00	3.00		
Module 3 -- Total Fixed Costs (Equipment Purchase + Installation)		$1,080	$1,080	$1,080	$696	$696
Module 3 -- Total Fixed Costs (Nozzles)		$0	$0	$0	$696	$696
Module 3 -- Total Fixed Costs (Dispensers)		$1,080	$1,080	$1,080	$0	$0
Module 3 -- Annualized Costs = Fixed Costs (Nozzles) x CRF3		$0	$0	$0	$280	$280
Module 3 -- Annualized Costs = Fixed Costs (Dispensers) x CRF2		$222	$222	$222	$0	$0
Module 3 -- Total Annualized Costs (All Equipment)		$222	$222	$222	$280	$280
		Avg Fixed	$926	Avg Annual		$245

Module 4 (Liquid Retention -- Redesigned Nozzle)

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	$54	3.25	3.25	3.25	3.25	3.25
Module 4 -- Total Fixed Costs (Equipment Purchase + Installation)		$176	$176	$176	$176	$176
Module 4 -- Annualized Costs = Fixed Costs x CRF3		$71	$71	$71	$71	$71
		Avg Fixed	$176	Avg Annual		$71

Module 5 (Spillage, including Dripless Nozzle)

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	$54	3.25	3.25	3.25	3.25	3.25
Module 5 -- Total Fixed Costs (All Equipment)		$176	$176	$176	$176	$176
Module 5 -- Annualized Costs = Fixed Costs x CRF3		$71	$71	$71	$71	$71
		Avg Fixed	$176	Avg Annual		$71

Module 6 (In-Station Diagnostics)

Components		(OLD)					
Sensors -- Pressure	$595	$192	1.0	1.0	1.0	1.0	1.0
Sensors -- A/L	$885	$245	1.5	1.5	1.5	1.5	1.5
Datalogger w/EPROM & new CPU/motherboard	$3,995	$1,197	1.0	1.0	1.0	1.0	1.0
Dispenser interface	$670		1.0	1.0	1.0	1.0	1.0
Inventory sensor (ATG)	$1,095		2.5	2.5	2.5	2.5	2.5
Installation Costs: assume retrofit costs of $300 base + $200 per dispenser							
	$600	$1,280	1.5	1.5	1.5	1.5	1.5
Module 6 -- Total Fixed Costs (All Equipment)			$9,925	$9,925	$9,925	$9,925	$9,925
Module 6 -- Annualized Costs = Total Fixed Costs x CRF1			$1,615	$1,615	$1,615	$1,615	$1,615
Module 6 - Annualized maintenance/calib/repair			$720	$720	$720	$720	$720
Additional cost for annual balance system tests			$800	$800	$800	$0	$0
			Avg Fixed	$9,925	Avg Annual		$2,815

Total Fixed Costs (All Modules)	$28,260	$28,260	$29,060	$27,229	$27,872
Total Annualized Fixed Costs (All Modules)	$6,669	$6,669	$6,858	$5,792	$5,889

Notes

Cost Recovery Factor CRF1 (10% discount, 10 yr. life)	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life)	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life)	0.4021

* from Healy Systems, 1999.

Average Total Fixed Cost	$28,136
Average Total Annualized Cost	$6,375

Estimated Equipment Costs for a Model GDF 3 Facility per Proposed Module

Proposed Module	Unit Cost 1999 Dollars	Number of Components in Model GDF Bal-1	Bal-2	Hybrid	Assist-1	Assist-2
Module 1 (Phase I)						
Phase I Components						
Pressure/Vacuum (P/V) valve	$65	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cover	$351	2.5	2.5	2.5	2.5	2.5
Drop tube & overfill protection	$178	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	$55	2.5	2.5	2.5	2.5	2.5
Installation Costs						
Pressure/Vacuum (P/V) Valve	$80	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cover	$160	2.5	2.5	2.5	2.5	2.5
Drop tube & overfill protection	$160	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	$80	2.5	2.5	2.5	2.5	2.5
Module 1 -- Total Fixed Cost (All Equipment)		$2,823	$2,823	$2,823	$2,823	$2,823
Module 1 -- Total Annualized Cost = Total Fixed Cost x CRF2		$580	$580	$580	$580	$580
		Avg Fixed	$2,823	Avg Annual		$580
Module 2 (Phase II w/pressure-related fugitives)						
Dispenser Components						
Nozzle -- Balance	$200	6.5	6.5			
Nozzle -- Hybrid	$231			6.5		
Nozzle -- Assist Type 1	$209				6.5	
Nozzle -- Assist Type 2	$225					6.5
Modified Equipment (Dispenser-related) -- Balance	$382	6.5	6.5			
Modified Equipment (Dispenser-related) -- Hybrid	$468			6.5		
Modified Equipment (Dispenser-related) -- Assist Type 1	$400				6.5	
Modified Equipment (Dispenser-related) -- Assist Type 2	$220					6.5
Auxilliary Items (incl. P/V, collection & processor)						
Assist Type 1	$7,500				1.0	
Assist Type 2	$9,000					1.0
Vapor processor						
for those Balance systems that use processors	$7,500	1.0	1.0	1.0		

Installation Costs							
Nozzle -- Balance	$86	$172	6.5	6.5			
Nozzle -- Hybrid	$108	$215			6.5		
Nozzle -- Assist Type 1	$48	$97				6.5	
Nozzle -- Assist Type 2	$54	$108					6.5
Modified Equipment (Dispenser-related) -- Balan	$172	$344	6.5	6.5			
Modified Equipment (Dispenser-related) -- Hybri	$215	$430			6.5		
Modified Equipment (Dispenser-related) -- Assis	$97	$194				6.5	
Modified Equipment (Dispenser-related) -- Assis	$108	$215					6.5
Auxilliary Items -- Assist Type 1	$1,506	$3,012				1.0	
Auxilliary Items -- Assist Type 2	$1,291	$2,581					1.0
Vapor processor -- Balance	$1,506	$3,012	1.0	1.0	1.0		
Module 2 -- Total Fixed Cost (All Equipment)			$17,649	$17,649	$19,251	$16,357	$16,573
Module 2 -- Total Fixed Cost (TFC Nozzles)			$1,859	$1,859	$2,202	$1,672	$1,811
Module 2 -- Total Fixed Cost (TFC Dispensers)			$3,600	$3,600	$4,439	$3,230	$2,132
Module 2 -- Total Fixed Cost (TFC All Other Equipment)			$12,190	$12,190	$12,609	$11,455	$12,630
Module 2 -- Annualized Cost = Fixed Costs (TFC Nozzles) x CRF3			$748	$748	$886	$672	$728
Module 2 -- Annualized Cost = Fixed Costs (TFC Dispensers) x CRF2			$740	$740	$912	$663	$438
Module 2 -- Annualized Cost = Fixed Cost (TFC All Others) x CRF1			$1,984	$1,984	$2,052	$1,864	$2,055
Module 2 -- Total Annualized Costs (All Equipment)			$3,471	$3,471	$3,850	$3,200	$3,222
			Avg Fixed	$17,496	Avg Annual		$3,443

Module 3 (ORVR Compatibility)

Components						
Nozzle (Healy ORVR compatible drop-in assist nozzle) Assumed 25% premium over Module 2-compliant nozzle (applies to assist only)	$54				6.5	6.5
Dispenser sensor & related electronics (Hoffer Flow Control)	$200	6.0	6.0	6.0		
Installation Costs						
Nozzle (Healy ORVR compatible drop-in assist nozzle)*	$160				6.5	6.5
Dispenser sensor & related electronics	$160	6.0	6.0	6.0		
Module 3 -- Total Fixed Costs (Equipment Purchase + Installation)		$2,160	$2,160	$2,160	$1,392	$1,392
Module 3 -- Total Fixed Costs (Nozzles)		$0	$0	$0	$1,392	$1,392
Module 3 -- Total Fixed Costs (Dispensers)		$2,160	$2,160	$2,160	$0	$0
Module 3 -- Annualized Costs = Fixed Costs (Nozzles) x CRF3		$0	$0	$0	$560	$560
Module 3 -- Annualized Costs = Fixed Costs (Dispensers) x CRF2		$444	$444	$444	$0	$0
Module 3 -- Total Annualized Costs (All Equipment)		$444	$444	$444	$560	$560
		Avg Fixed	$1,853	Avg Annual		$490

Module 4 (Liquid Retention -- Redesigned Nozzle)

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	$54	6.5	6.5	6.5	6.5	6.5
Module 4 -- Total Fixed Costs (Equipment Purchase + Installation)		$351	$351	$351	$351	$351
Module 4 -- Annualized Costs = Fixed Costs x CRF3		$141	$141	$141	$141	$141
		Avg Fixed	$351	Avg Annual		$141

Module 5 (Spillage, including Dripless Nozzle)

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	$54	6.5	6.5	6.5	6.5	6.5
Module 5 -- Total Fixed Costs (All Equipment)		$351	$351	$351	$351	$351
Module 5 -- Annualized Costs = Fixed Costs x CRF3		$141	$141	$141	$141	$141
		Avg Fixed	$351	Avg Annual		$141

Module 6 (In-Station Diagnostics)

Components	(OLD)						
Sensors -- Pressure	$192	$595	1.0	1.0	1.0	1.0	1.0
Sensors -- A/L	$245	$885	3.0	3.0	3.0	3.0	3.0
Datalogger w/EPROM & new CPU/motherboard	$1,197	$3,995	1.0	1.0	1.0	1.0	1.0
Dispenser interface		$670	1.0	1.0	1.0	1.0	1.0
Inventory sensor (ATG)		$1,095	2.5	2.5	2.5	2.5	2.5
Installation Costs: assume retrofit costs of $300 base + $200 per dispenser							
		$900	3.0	3.0	3.0	3.0	3.0
Module 6 -- Total Fixed Costs (All Equipment)			$11,556	$11,556	$11,556	$11,556	$11,556
Module 6 -- Annualized Costs = Total Fixed Costs x CRF1			$1,881	$1,881	$1,881	$1,881	$1,881
Module 6 - Annualized maintenance/calib/repair			$1,170	$1,170	$1,170	$1,170	$1,170
Additional cost for annual balance system tests			$800	$800	$800	$0	$0
			Avg Fixed	$11,556	Avg Annual		$3,531

Total Fixed Costs (All Modules)	$34,890	$34,890	$36,492	$32,830	$33,046
Total Annualized Fixed Costs (All Modules)	$8,628	$8,628	$9,006	$7,673	$7,694

Notes

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) -- All	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life) -- Disp	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life) -- Noz	0.4021

* from Healy Systems, 1999.

Average Total Fixed Cost	$34,430
Average Total Annualized Cost	$8,326

Estimated Equipment Costs for a Model GDF 4 Facility per Proposed Module

Proposed Module	Unit Cost 1999 Dollars	Number of Components in Model GDF Bal-1	Bal-2	Hybrid	Assist-1	Assist-2
Module 1 (Phase I)						
Phase I Components						
Pressure/Vacuum (P/V) valve	$65	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cover	$351	2.5	2.5	2.5	2.5	2.5
Drop tube & overfill protection	$178	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	$55	2.5	2.5	2.5	2.5	2.5
Installation Costs						
Pressure/Vacuum (P/V) Valve	$80	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cover	$160	2.5	2.5	2.5	2.5	2.5
Drop tube & overfill protection	$160	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	$80	2.5	2.5	2.5	2.5	2.5
Module 1 -- Total Fixed Cost (All Equipment)		$2,823	$2,823	$2,823	$2,823	$2,823
Module 1 -- Total Annualized Cost = Total Fixed Cost x CRF2		$580	$580	$580	$580	$580
		Avg Fixed	$2,823	Avg Annual		$580
Module 2 (Phase II w/pressure-related fugitives)						
Dispenser Components						
Nozzle -- Balance	$200	9.8	9.75			
Nozzle -- Hybrid	$231			9.75		
Nozzle -- Assist Type 1	$209				9.75	
Nozzle -- Assist Type 2	$225					9.75
Modified Equipment (Dispenser-related) -- Balance	$382	9.75	9.75			
Modified Equipment (Dispenser-related) -- Hybrid	$468			9.75		
Modified Equipment (Dispenser-related) -- Assist Type	$400				9.75	
Modified Equipment (Dispenser-related) -- Assist Type	$220					9.75
Auxilliary Items (incl. P/V, collection & processor)						
Assist Type 1	$7,500				1.00	
Assist Type 2	$9,000					1.00
Vapor processor						
for those Balance systems that use processors	$7,500	1.00	1.00	1.00		

Installation Costs		(OLD)					
Nozzle -- Balance	$172	$86	9.75	9.75			
Nozzle -- Hybrid	$215	$108			9.75		
Nozzle -- Assist Type 1	$97	$48				9.75	
Nozzle -- Assist Type 2	$108	$54					9.75
Modified Equipment (Dispenser-related) -- Balance	$344	$172	9.75	9.75			
Modified Equipment (Dispenser-related) -- Hybrid	$430	$215			9.75		
Modified Equipment (Dispenser-related) -- Assist Type	$194	$97				9.75	
Modified Equipment (Dispenser-related) -- Assist Type	$215	$108					9.75
Auxilliary Items -- Assist Type 1	$3,012	$1,506				1.00	
Auxilliary Items -- Assist Type 2	$2,581	$1,291					1.00
Vapor processor -- Balance	$3,012	$1,506	1.00	1.00	1.00		

Module 2 -- Total Fixed Cost (All Equipment)	$21,218	$21,218	$23,621	$19,280	$19,069
Module 2 -- Total Fixed Cost (TFC Nozzles)	$2,789	$2,789	$3,303	$2,508	$2,716
Module 2 -- Total Fixed Cost (TFC Dispensers)	$5,401	$5,401	$6,659	$4,845	$3,198
Module 2 -- Total Fixed Cost (TFC All Other Equipment)	$13,029	$13,029	$13,658	$11,927	$13,154
Module 2 -- Annualized Cost = Fixed Costs (TFC Nozzles) x CRF3	$1,121	$1,121	$1,328	$1,009	$1,092
Module 2 -- Annualized Cost = Fixed Costs (TFC Dispensers) x CRF2	$1,109	$1,109	$1,368	$995	$657
Module 2 -- Annualized Cost = Fixed Cost (TFC All Others) x CRF1	$2,120	$2,120	$2,223	$1,941	$2,141
Module 2 -- Total Annualized Costs (All Equipment)	$4,351	$4,351	$4,919	$3,945	$3,890
	Avg Fixed	$20,881	Avg Annual		$4,291

Module 3 (ORVR Compatibility)

Components						
Nozzle (Healy ORVR compatible drop-in assist nozzle	$54				9.8	9.8
Assumed 25% premium over Module 2-compliant nozzle (applies to assist only)						
Dispenser sensor & related electronics (Hoffer Flow Control)	$200	9.0	9.0	9.0		
Installation Costs						
Nozzle (Healy ORVR compatible drop-in assist nozzle	$160				9.8	9.8
Dispenser sensor & related electronics	$160	9.0	9.0	9.0		
Module 3 -- Total Fixed Costs (Equipment Purchase + Installation)		$3,240	$3,240	$3,240	$2,088	$2,088
Module 3 -- Total Fixed Costs (Nozzles)		$0	$0	$0	$2,088	$2,088
Module 3 -- Total Fixed Costs (Dispensers)		$3,240	$3,240	$3,240	$0	$0
Module 3 -- Annualized Costs = Fixed Costs (Nozzles) x CRF3		$0	$0	$0	$840	$840
Module 3 -- Annualized Costs = Fixed Costs (Dispensers) x CRF2		$666	$666	$666	$0	$0
Module 3 -- Total Annualized Costs (All Equipment)		$666	$666	$666	$840	$840
		Avg Fixed	$2,779	Avg Annual		$735

Module 4 (Liquid Retention -- Redesigned Nozzle)

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	$54	9.75	9.75	9.75	9.75	9.75
Module 4 -- Total Fixed Costs (Equipment Purchase + Installation)		$527	$527	$527	$527	$527
Module 4 -- Annualized Costs = Fixed Costs x CRF3		$212	$212	$212	$212	$212
		Avg Fixed	$527	Avg Annual		$212

Module 5 (Spillage, including Dripless Nozzle)

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	$54	9.75	9.75	9.75	9.75	9.75
Module 5 -- Total Fixed Costs (All Equipment)		$527	$527	$527	$527	$527
Module 5 -- Annualized Costs = Fixed Costs x CRF3		$212	$212	$212	$212	$212
		Avg Fixed	$527	Avg Annual		$212

Module 6 (In-Station Diagnostics)

Components		(OLD)					
Sensors -- Pressure	$595	$192	1.0	1.0	1.0	1.0	1.0
Sensors -- A/L	$885	$245	4.5	4.5	4.5	4.5	4.5
Datalogger w/EPROM & new CPU/motherboard	$3,995	$1,197	1.0	1.0	1.0	1.0	1.0
Dispenser interface	$670		1.0	1.0	1.0	1.0	1.0
Inventory sensor (ATG)	$1,095		2.5	2.5	2.5	2.5	2.5
Installation Costs: assume retrofit costs of $300 base + $200 per dispenser							
	$1,200	$1,280	4.5	4.5	4.5	4.5	4.5
Module 6 -- Total Fixed Costs (All Equipment)			$13,180	$13,180	$13,180	$13,180	$13,180
Module 6 -- Annualized Costs = Total Fixed Costs x CRF1			$2,145	$2,145	$2,145	$2,145	$2,145
Module 6 - Annualized maintenance/calib/repair			$1,620	$1,620	$1,620	$1,620	$1,620
Additional cost for annual balance system tests			$800	$800	$800	$0	$0
			Avg Fixed	$13,180	Avg Annual		$4,245

Total Fixed Costs (All Modules)	$41,515	$41,515	$43,917	$38,425	$38,214
Total Annualized Fixed Costs (All Modules)	$10,585	$10,585	$11,153	$9,553	$9,498

Notes

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) -	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life) --	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life) --	0.4021

* from Healy Systems, 1999.

Average Total Fixed Cost	$40,717
Average Total Annualized Cost	$10,275

Estimated Equipment Costs for a Model GDF 5 Facility per Proposed Module

Proposed Module	Unit Cost 1999 Dollars	Number of Components in Model GDF Bal-1	Bal-2	Hybrid	Assist-1	Assist-2
Module 1 (Phase I)						
Phase I Components						
Pressure/Vacuum (P/V) valve	$65	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cover	$351	2.5	2.5	2.5	2.5	2.5
Drop tube & overfill protection	$178	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	$55	2.5	2.5	2.5	2.5	2.5
Installation Costs						
Pressure/Vacuum (P/V) Valve	$80	2.5	2.5	2.5	2.5	2.5
Low-emission spill containment and cover	$160	2.5	2.5	2.5	2.5	2.5
Drop tube & overfill protection	$160	2.5	2.5	2.5	2.5	2.5
Rotatable adaptor	$80	2.5	2.5	2.5	2.5	2.5
Module 1 -- Total Fixed Cost (All Equipment)		$2,823	$2,823	$2,823	$2,823	$2,823
Module 1 -- Total Annualized Cost = Total Fixed Cost x CRF2		$580	$580	$580	$580	$580
		Avg Fixed	$2,823	Avg Annual		$580
Module 2 (Phase II w/pressure-related fugitives)						
Dispenser Components						
Nozzle -- Balance	$200	16.3	16.25			
Nozzle -- Hybrid	$231			16.25		
Nozzle -- Assist Type 1	$209				16.25	
Nozzle -- Assist Type 2	$225					16.25
Modified Equipment (Dispenser-related) -- Balance	$382	16.25	16.25			
Modified Equipment (Dispenser-related) -- Hybrid	$468			16.25		
Modified Equipment (Dispenser-related) -- Assist Type 1	$400				16.25	
Modified Equipment (Dispenser-related) -- Assist Type 2	$220					16.25
Auxilliary Items (incl. P/V, collection & processor)						
Assist Type 1	$7,500				1.00	

Assist Type 2	$9,000						1.00
Vapor processor							
for those Balance systems that use processors	$7,500		1.00	1.00	1.00		
Installation Costs		(OLD)					
Nozzle -- Balance	$172	$86	16.25	16.25			
Nozzle -- Hybrid	$215	$108			16.25		
Nozzle -- Assist Type 1	$97	$48				16.25	
Nozzle -- Assist Type 2	$108	$54					16.25
Modified Equipment (Dispenser-related) -- Balance	$344	$172	16.25	16.25			
Modified Equipment (Dispenser-related) -- Hybrid	$430	$215			16.25		
Modified Equipment (Dispenser-related) -- Assist Type 1	$194	$97				16.25	
Modified Equipment (Dispenser-related) -- Assist Type 2	$215	$108					16.25
Auxilliary Items -- Assist Type 1	$3,012	$1,506				1.00	
Auxilliary Items -- Assist Type 2	$2,581	$1,291					1.00
Vapor processor -- Balance	$3,012	$1,506	1.00	1.00	1.00		

Module 2 -- Total Fixed Cost (All Equipment)	$22,655	$22,655	$25,610	$21,261	$20,148
Module 2 -- Total Fixed Cost (TFC Nozzles)	$4,648	$4,648	$5,506	$4,180	$4,527
Module 2 -- Total Fixed Cost (TFC Dispensers)	$9,001	$9,001	$11,099	$8,075	$5,331
Module 2 -- Total Fixed Cost (TFC All Other Equipment)	$9,006	$9,006	$9,006	$9,006	$10,291
Module 2 -- Annualized Cost = Fixed Costs (TFC Nozzles) x CRF3	$1,869	$1,869	$2,214	$1,681	$1,820
Module 2 -- Annualized Cost = Fixed Costs (TFC Dispensers) x CRF2	$1,849	$1,849	$2,280	$1,659	$1,095
Module 2 -- Annualized Cost = Fixed Cost (TFC All Others) x CRF1	$1,466	$1,466	$1,466	$1,466	$1,675
Module 2 -- Total Annualized Costs (All Equipment)	$5,184	$5,184	$5,959	$4,805	$4,590
	Avg Fixed	$22,466	Avg Annual		$5,144

Module 3 (ORVR Compatibility)

Components						
Nozzle (Healy ORVR compatible drop-in assist nozzle)	$54				16.25	16.25
Assumed 25% premium over Module 2-compliant nozzle (applies to assist only)						
Dispenser sensor & related electronics (Hoffer Flow Control)	$200	12.00	12.00	12.00		
Installation Costs						
Nozzle (Healy ORVR compatible drop-in assist nozzle)*	$160				16.25	16.25
Dispenser sensor & related electronics	$160	12.00	12.00	12.00		
Module 3 -- Total Fixed Costs (Equipment Purchase + Installation)		$4,320	$4,320	$4,320	$3,481	$3,481
Module 3 -- Total Fixed Costs (Nozzles)		$0	$0	$0	$3,481	$3,481
Module 3 -- Total Fixed Costs (Dispensers)		$4,320	$4,320	$4,320	$0	$0
Module 3 -- Annualized Costs = Fixed Costs (Nozzles) x CRF3		$0	$0	$0	$1,400	$1,400
Module 3 -- Annualized Costs = Fixed Costs (Dispensers) x CRF2		$887	$887	$887	$0	$0
Module 3 -- Total Annualized Costs (All Equipment)		$887	$887	$887	$1,400	$1,400
		Avg Fixed	$3,984	Avg Annual		$1,092

Module 4 (Liquid Retention -- Redesigned Nozzle)

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	$54	16.25	16.25	16.25	16.25	16.25
Module 4 -- Total Fixed Costs (Equipment Purchase + Installation)		$878	$878	$878	$878	$878
Module 4 -- Annualized Costs = Fixed Costs x CRF3		$353	$353	$353	$353	$353
		Avg Fixed	$878	Avg Annual		$353

Module 5 (Spillage, including Dripless Nozzle)

Assumed 25% premium over Module 2-compliant nozzle; in-nozzle design only; no extra installation	$54	16.25	16.25	16.25	16.25	16.25
Module 5 -- Total Fixed Costs (All Equipment)		$878	$878	$878	$878	$878
Module 5 -- Annualized Costs = Fixed Costs x CRF3		$353	$353	$353	$353	$353
		Avg Fixed	$878	Avg Annual		$353

Module 6 (In-Station Diagnostics)

Components		(OLD)					
Sensors -- Pressure	$595	$192	1.00	1.00	1.00	1.00	1.00
Sensors -- A/L	$885	$245	6.00	6.00	6.00	6.00	6.00
Datalogger w/EPROM & new CPU/motherboard	$3,995	$1,197	1.00	1.00	1.00	1.00	1.00
Dispenser interface	$670		1.0	1.0	1.0	1.0	1.0
Inventory sensor (ATG)	$1,095		2.5	2.5	2.5	2.5	2.5
Installation Costs: assume retrofit costs of $300 base + $200 per dispenser							
Assumed 2 person-days/dispenser for ISD installation	$1,500	$1,280	6.0	6.00	6.00	6.00	6.00
Module 6 -- Total Fixed Costs (All Equipment)			$14,808	$14,808	$14,808	$14,808	$14,808
Module 6 -- Annualized Costs = Total Fixed Costs x CRF1			$2,410	$2,410	$2,410	$2,410	$2,410
Module 6 - Annualized maintenance/calib/repair			$2,070	$2,070	$2,070	$2,070	$2,070
Additional cost for annual balance system tests			$800	$800	$800	$0	$0
			Avg Fixed	$14,808	Avg Annual		$4,960

Total Fixed Costs (All Modules)	$46,362	$46,362	$49,317	$44,128	$43,016
Total Annualized Fixed Costs (All Modules)	$12,637	$12,637	$13,413	$11,971	$11,756

Notes

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) --	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life) -- D	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life) -- N	0.4021

* from Healy Systems, 1999.

Average Total Fixed Cost	$45,837
Average Total Annualized Cost	$12,483

Research & Development Costs for All Proposed Modules

Source	Unit Cost or Value
Staff Costs	
Phase I systems	
Engineering	
Assumed number of full-time engineers needed per certification	1
Annual cost per engineer (salary + benefits)	$100,000
Number of years required per certification	1
Non-engineering	
Support staff needed per certfication (assume 1 support per 2 engineers)	0.5
Annual cost per support staff (salary + benefits; assume 50% of engineer cost)	$50,000
Number of years required per certification	1
Total R&D Staff Costs per Phase I certification	$125,000
Phase II & ISD systems	
Engineering	
Assumed number of full-time engineers needed per certification	2
Annual cost per engineer (salary + benefits)	$100,000
Number of years required per certification	2
Non-engineering	
Support staff needed per certfication (assume 1 support per 2 engineers)	1
Annual cost per support staff (salary + benefits; assume 50% of engineer cost)	$50,000
Number of years required per certification	2
Total R&D Staff Costs per Phase II and ISD Certification	$500,000
Component & Systems Development Costs (CSDC) per Certification	
Design, prototype development, & commercialization cost per certification (assume 10% of total staff costs)	$50,000
Miscellaneous Costs	
Marketing costs per certification (assumed 25% of CSDC)	$12,500
Total number of Phase II recertifications (as of 01/01/2000)	32
ISD systems to be developed & certified (assume 25% of total Ph II recertifications)	8
Total number of Phase I recertifications (as of 01/01/2000)	14

Total Research & Development Costs	$25,125,000
Annualized R&D Costs (CRF @ 10% discount rate, 5 yrs)	$6,627,912

Certification and Testing Costs for All Proposed Modules

Source	Unit Cost or Value
ARB Certification Fees	
Typical current ARB fees per Phase II certification	$10,000
Typical current ARB fees per Phase I certification	$2,000
Multiplier for increase in test period (to 6 mos) & test matrix (to 200 cars)	5
Total number of recertifications	
Phase II	32
Phase I	14
Est. number of ISD certifications	8
Total ARB Certification Fees (assume fee for ISD same as for Phase II)	$2,140,000
Manufacturers' Certification Fees	
Typical current Phase II cost per certification (site preparation, testing)	$170,000
Typical current Phase I cost per certification (assume 20% of Phase II)	$34,000
Multiplier for increase in test period (to 6 mos) & test matrix (to 200 cars)	2
Total number of Phase II recertifications	32
Est. number of new certifications (i.e., ISD systems or components)	8
Total number of Phase I recertifications	14
Total Manufacturers' Phase I, Phase II, & ISD Certification Costs	$14,552,000
Total Certification (ARB + Manufacturers) Costs (over 4 years)	$16,692,000
Annualized Certification Costs (CRF @ 10% discount rate, 4 yrs)	$4,403,308

Notes:
(1) 4 yr annualization period for cost recovery factor (CRF) reflects proposed 4-yr cert. lifetimes
(2) $170,000 typical manuf. certification costs includes $75,000 on-site + $75,000 internal engineering and lab costs to prepare for field certification + $20,000 for pressure monitoring.
(3) Typical ARB certification fees taken from most recent ARB invoices for Phase I/II testing.

GDF Population Distribution

National GDF Distribution in 1991	
Gal/mo	Percent of GDFs
3,000	3.80%
8,000	4.80%
17,500	15.00%
37,500	23.50%
75,000	32.30%
150,000	18.20%
300,000	2.40%

PWA (1991 70,661 gal/mo

Source: EPA, 1991
PWA = population-wtd average

Est. California Distribution in 1998	
Gal/mo	Percent of GDFs
3,000	0.76%
8,000	0.96%
17,500	3.00%
37,500	14.10%
75,000	45.65%
150,000	31.30%
300,000	4.22%

PWA (1998) : 99,779 gal/mo

Source: Staff adjustment of EPA, 1991 distribution to fit current average (pop-wtd avg = 99865)

Ref. Source

1 "1999 State of the Industry Report," National Assoc. of Convience Stores, <http://www.cstorecentral.com/register/resource/resource/99soihighlights.html, visited on 01/03/00.

Notes: (a) 1998 average motor fuel sold per store = 95,100 gals/month
(b) Because of 1998's low fuel prices, the average margin cents per gallon dropped to 12.6 cents compared to 1997's 13.4 cents.

2 "EBW Vapor Recovery Equipment Price List," price list spreadsheet from EBW Web site, <http://www.ebw.com/pricelst>, visited on 01/03/00.

Notes: (a) breakaways (avg = $32.50 each)
(b) drop tubes (avg = $111 each, CARB approved)
(c) P/V valves (avg = $65 each, CARB approved)
(d) EPROM + main CPU board (avg = $725 each)
(e) spill containment "bucket" with drain (avg = $482 each)

3 "Model 800 Intelligent ORVR Nozzle," Powerpoint presentation by Healy Systems, <http://www.healysystems.com/NozzlesandHoses/NozzlesandHoses.ppt>, visited on 01/03/00.

Notes: (a) "No excavation of downtime loss with Healy," Slide 14.
(b) "No additional installation costs," Slide 14.
(c) "Retrofit product: approximate installation time takes 2 workers one day per 4 multi-product dispenser station," Slide 14.

4 "Healy ORVR System," <http://www.healysystems.com/orvr1.htm>, visited on 01/13/00.

Notes: (a) "...Healy Model 800 Nozzle converts your vacuum assist dispensers to ORVR with no added below-ground systems and no new electronics."
(b) "...Healy Systems gives you the whole package in the nozzle."